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From: Beckwith, William
Sent: Tuesday, May 14, 2013 1:35 PM
To: Reese, Carl D (DEC); Tabor, Brock N (DEC)
Cc: Sonafrank, Nancy B (DEC); Chung, Angela
Subject: Draft Decision Document for WQS Revisions for Tributaries to the Chuit River

Carl and Brock-

Below are comments on the draft proposed site-specific criteria for copper, zinc, and aluminum contained in "Alaska Department of Environmental Conservation Decision Document for Site-Specific Criteria (SSC) for Bass Creek, Middle Creek and Lone Creek, Tributaries of the Chuit River," Public Notice draft, March 10, 2013. These comments also address questions that ADEC has asked in emails of 3/6/13, 3/8/13, and 3/21/13, from Carl Reese, concerning the draft proposed site-specific criteria for those metals.

Comments concerning the proposed seasonal use revision and criteria revision for manganese have been provided previously by emails of 3/12/13 to Brock Tabor; 4/3/13 (with 4/4/13 resend to include omitted attachment) to Carl Reese; 4/10/13 to Brock Tabor; and 4/19/13 to Carl Reese (forwarding 4/10/13 comments). Those comments are summarized below for convenience.

As you read the comments you will see that there are some key points with regard to the draft proposed site-specific criteria that EPA is still reviewing.

Please contact me if you have questions.

- Bill
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Comments on Copper, Zinc, and Aluminum

► Hypothesis testing can be used to evaluate the results of the metals mixture test; however, we need to verify that it is appropriate to conclude that significant toxicity did not occur in the metal mixture test with D. magna. The toxicity test data and the actual statistical analysis are not part of Tetra Tech's 1/7/11 memorandum presenting the metals mixture test results. 100% survival was reported for the un-spiked site water, thus there was no variability across the replicates. Knowledge of what mortality occurred in each replicate in the spiked site water treatment that yielded 85% survival is also important in evaluating the results. This is one reason EPA suggested that ADEC request additional information from PacRim/Tetra Tech, i.e., a "full report" of the metals mixture toxicity test as I referred to it in a 4/10/13 email. On 4/26/13 ADEC forwarded another copy of the 1/7/11 memorandum without additional detail. Performance in the individual test replicates can be obtained from the toxicity test bench sheets.

Previous comments from EPA had stated that hypothesis testing was not appropriate. The change in position here is based on EPA publications that specify the use of hypothesis testing for whole effluent toxicity tests in the NPDES permit program, including the recent document "National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document," EPA 833-R-10-033, June 2010. There is also recent literature that supports the use of this approach. Two of those papers are listed here:

Zheng, L, JM Diamond, and DL Denton. 2013. Environ. Toxicol. Chem. 32(2):468-474. Evaluation of Whole Effluent Toxicity Data Characteristics and Use of Welch's t-Test in the Test of Significant Toxicity Analysis.

Diamond, JM, DL Denton, JW Roberts Jr., and L Zheng. 2013. Environ. Toxicol. Chem. 32(5):1101-1108. Evaluation of the Test of Significant Toxicity for Determining the Toxicity of Effluents and Ambient Water Samples.

► As has been noted in past emails and discussion of the metals mixture test, all of the data for the site water sample used in the metals mixture test should be reviewed to ensure that it was a representative sample. Tetra Tech's 1/7/11 memorandum and a 12/7/10 email from Dan Graham of PacRim include the following discussions of the site water sample, respectively, indicating that there are data for total and dissolved organic carbon, total and dissolved metals (Al, Cu, Pb, and Zn), pH, conductivity, dissolved oxygen, alkalinity, hardness, TSS and site water stream flow.

"A grab sample was collected from Chuitna site 141, the same location where other site water samples were collected for WER testing. Samples were packaged and shipped to Tetra Tech's laboratory in Owings Mills, MD on December 7, 2010. This sample was handled and transported in the same manner as all other WER samples (as described in the August 19, 2009 Study Plan and in Tetra Tech's WER Report March 12, 2010). Two sub-samples of this sample were prepared for analysis of total and dissolved organic carbon and both total and dissolved metals (Al, Cu, Pb, and Zn). In addition to these analyses pH, conductivity, dissolved oxygen, alkalinity, and hardness were measured on the sample upon receipt in the laboratory. The sample to be analyzed for dissolved metals was field-filtered within 15 minutes of collection." (emphasis added), and

"TSS and flow measurements were part of the parameters taken with the sample today." (emphasis added)

Tetra Tech's 1/7/11 memorandum includes the total (total recoverable) and dissolved metals data. The file titled "Water Quality Comparisons Box Plots" that was attached to a 4/26/13 email from Carl Reese contains data for total organic carbon, total alkalinity, hardness as CaCO₃, and specific conductivity for "WER Rep 4." One might assume that WER Rep 4 is the site-water sample used in the metal mixture test; but no explanation was provided to verify this, and data for the other parameters highlighted above were not included.

► A third point concerning additional information related to the metals mixture test; a 12/14/10 email from Dan Graham of PacRim indicated that Tetra Tech ran a series of tests spanning the target level for the WER confirmation tests. Both ADEC and EPA had suggested such testing because it could be useful in evaluating the effects of the metals in combination. Tetra Tech's 1/7/11 memorandum includes results for just a single spiked treatment. There has been no response from ADEC or Dan Graham/PacRim to EPA's 4/3/13 inquiry asking if there are additional data.

► From the above discussion, if the site water sample used was representative, the metals mixture test as reported by Tetra Tech on 1/7/11 did not produce significant mortality, and other data do not justify a different conclusion, then:

Copper

ADEC could use the mean of the measured dissolved copper concentrations, from the spiked site water treatment in the metals mixture tests with D. magna and fathead minnows (Tables 2 and 3 of Tetra Tech's 1/7/11 memorandum), in establishing a site-specific dissolved acute criterion. Based on this, the site-specific dissolved copper acute criterion concentration should not be higher than 15.2 ug/L. A site-specific dissolved chronic criterion concentration could be derived from the site-specific dissolved acute criterion concentration using the same relationship that exists between Alaska's statewide acute and chronic copper criteria.

Note that the metals mixture test was an acute test. In ADEC's draft decision document, however, the mean measured dissolved copper concentration ("15 ug/L" from Table 5, page 14) is applied as a chronic criterion concentration. Acute tests can be used to determine a WER that is used to adjust a chronic criterion, but the draft copper criterion concentration of 15 ug/L is based on the absolute results of an acute toxicity test, not a WER, and could only be applied as an acute criterion concentration.

ADEC's draft decision document, Table 5, contains a proposed site-specific dissolved acute criterion concentration for copper of 22 ug/L which appears to be based on the geometric mean WER of 6.17 and the statewide acute criterion at a hardness of 25 mg/l from Table 5.1 of the WER report (Determination of an Aluminum, Copper, Lead, and Zinc Water Effect Ratio for the Chit River Basin, Alaska, Tetra Tech Inc, March 12, 2010). This approach to establishing an acute criterion concentration is inconsistent with the results of the metals mixture text.

Zinc

The mean of the measured dissolved concentrations of zinc, from the spiked site water treatment in the metals mixture tests with D. magna and fathead minnows (Tables 2 and 3 of Tetra Tech's 1/7/11 memorandum), was 32.8 ug/L. This data could be used in the same way as discussed for copper. The site-specific dissolved zinc acute criterion concentration should not be higher than 32.8 ug/L; and the acute and chronic site-specific criteria concentrations for dissolved zinc would be the same, consistent with the relationship between ADEC's statewide acute and chronic zinc criteria.

ADEC has proposed acute and chronic site-specific criteria concentrations for dissolved zinc set at 43 ug/L (Table 5, page 14, of the draft decision document). The concentration of 43 ug/L is calculated using a geometric mean WER of 1.17 that was determined in the single-metal WER tests, and is justified as "a comparatively small change" and as "a conservative approach". However, there are no test results that show that 43 ug dissolved zinc/L is acceptable when the concentrations of aluminum and copper are elevated to the concentrations proposed in the site-specific criteria. There are no data that support a conclusion that the proposed acute and chronic site-specific dissolved zinc criteria concentration of 43 ug/L represents a conservative approach, and such a conclusion is inconsistent with the results of the metals mixture text.

Aluminum

The mean of the measured total recoverable aluminum concentrations, from the spiked site water treatment in the metals mixture tests with D. magna and fathead minnows (Tables 2 and 3 of Tetra Tech's 1/7/11 memorandum), was 681 ug/L. The site-specific total recoverable aluminum acute criterion concentration should not be higher than 681 ug/L. EPA is still discussing approaches for establishing an acceptable site-specific total recoverable aluminum chronic criterion concentration from the available data.

Various combinations of higher concentrations of one or more of the metals might be acceptable, but that was not demonstrated in the mixture tests.

► ADEC should ensure that the proposed criteria for copper, zinc, and aluminum include appropriate duration and frequency components in addition to the criteria concentrations. Tables 5 and 8 of the draft decision document only specify the proposed criteria concentrations.

► Looking back at the WER study and Table 5 of ADEC's draft decision document, it is unclear as to why a hardness of 25 mg/L has been used to establish the statewide criteria concentration values that the WERs have

been applied to. The hardness values for the three site water samples used in WER testing were reported as 12, 16, and 18 mg/L. Furthermore, endnote 25 in “Alaska Water Quality Criteria Manual For Toxic And Other Deleterious Organic and Inorganic Substances,” specifies that the actual hardness of the surface water be used when the hardness is less than 25 mg/L as CaCO₃.

Previous Comments on Manganese

► With regard to manganese, multiplying the drinking water intake by the modifying factor of 3 (i.e., using a drinking water intake of 6 liters rather than 2 liters) and using the RfD of 0.14 mg/kg/day in the water + organism human health criteria equation would be an appropriate approach because the modifying factor is only recommended for use with the drinking water exposure and not the fish consumption exposure. This should not, however, be interpreted to mean that this method of applying the modifying factor is conservative. Rather, applying the modifying factor to both the drinking water exposure and the fish consumption exposure, by using a modified RfD of 0.05 mg/kg/day, would be the conservative approach of the two.

► Also with regard to manganese:

- The seasonal use revision for manganese was not included with the revised draft decision document, so based on the 1/11/13 version (note that the cover page is dated 1/11/12)...I suggest that the discussion of agriculture in the context of existing uses and attainable uses be revised to explicitly address both commercial agricultural uses and local subsistence agricultural uses. At least as I read the discussion, it seems to be focused on commercial aspects. For the existing use discussion, ensure that the basis/supporting information for concluding that agricultural uses have not occurred on or after November 28, 1975 is clearly presented.

- In the draft decision document concerning the seasonal agricultural use, there are references to “setting seasonal limits.” First, I presume ADEC means criteria rather than “limits,” and second, “setting” could lead to confusion that seasonal criteria to protect agriculture are being developed. As I understand, the proposal is to revise the WQS such that the agricultural uses (or just the irrigation use?) and the current manganese criterion to protect irrigation (200 ug/l) will only apply to the specified waters from June 1 to September 15. If the applicability of criteria to protect irrigation for parameters in addition to manganese would also be revised to June 1 to September 15 only, this should be explicitly discussed. The 18 AAC 70.230(e) table in the draft decision document should also be clarified. There is a “*****” notation followed by the text “Protected for irrigation during summer growing season only from June 1 to September 15,” but the notation is associated with a designated use class of “(1)(a)(iii).” Presumably this meant to be 18 AAC 70.020(a)(1)A(ii)? In summary, please clarify specifically what WQS revisions, affecting what uses and criteria, are to be proposed.

- Attached are summaries of literature on manganese that EPA is actively reviewing in conjunction with Contaminant Candidate Lists under the Safe Drinking Water Act (Manganese Summaries 2-6-2013). The summaries do not represent a full literature review of all the manganese health effects data, but EPA believes that many of the relevant studies are included. There are quite a few publications on oral exposure to manganese that postdate the IRIS assessment, and we believe ADEC should be aware of that. This current information suggests that a new risk assessment will likely need to consider child specific exposure factors due to increased sensitivity to manganese in infants and possibly children.

► We are still reviewing ADEC’s proposal to raise a calculated manganese value of “0.29 mg/l” (actually calculated as 0.293 mg/l, and rounded?) to 0.300 mg/l on the basis that it is not statistically different. ADEC should ensure that its basis for any such handling of the calculated values is clearly explained.

► Also, with regard to the BCF-BAF value used in the manganese calculations:

- In a 2/2/10 draft document “Development of site-specific Human Health Water Quality Standards for Manganese for the Chuit River Basin, Alaska,” Tetra Tech did calculations with a BCF (or BAF?) of 5.07 for salmon based on site-specific info, and a BCF from the literature for brown trout of 17.8.

- In a 1/13/11 memorandum “Revision of site-specific Mn criteria based on EPA comments,” Tetra Tech used a site-specific BCF (really a BAF?) of 3.45, reported as being the mean of two values, 1.3 and 5.6, from two locations in the proposed project area. I understand that the 17.8 was not used based on EPA comments, but I found no explanation about what happened to the 5.07 used in the 2/2/10 document.

- ADEC, in its revised draft decision document, used the info from Tetra Tech’s 1/13/11 memorandum, but changed the 3.45 calculated by Tetra Tech to 3.4.

ADEC should ensure that it provides sound rationale for the BCF-BAF it chooses, including documentation that the chosen value was appropriately derived.

General Comment Concerning Protection of Downstream Waters

► There has been an increased focus recently on ensuring that new and revised water quality standards are consistent with 40 CFR 131.10(b), which provides:

“In designating uses of a water body and the appropriate criteria for those uses, the State shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters.”

ADEC should ensure that any use revisions and site-specific criteria that are adopted address consistency with 40 CFR 131.10(b). EPA believes this can be done using either narrative or numeric approaches.